

University of Bahrain

Department of Computer Science

ITCS314 Automata and Formal Languages

Quiz 1 (Chapter 1)

ID:

Name:

3
10

Q1. What language does this grammar generate?

$S \rightarrow aSb \mid A$

$A \rightarrow aA \mid a$

aab aaoob
aaaa a
aaobb

$\{ a^n b^m : n > 0, m \geq 0 \}$

X 2

Q2. Find a grammar for the language palindrome which contains word that are read the same, left to right or right to left.

$L = \{ w \in \{a,b\}^* : w = w^R \}$

2

$S \rightarrow AaSaA \mid BbSbB$

$A \rightarrow a \mid \lambda$

$B \rightarrow b \mid \lambda$

ab ba
baab

aa
baab

University of Bahrain

Department of Computer Science

ITCS314 Automata and Formal Languages

ID:

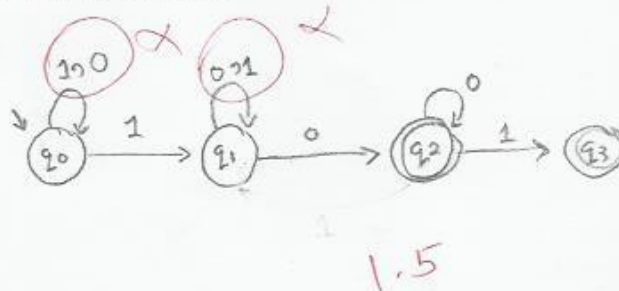
Name:

Quiz2

5.5
10

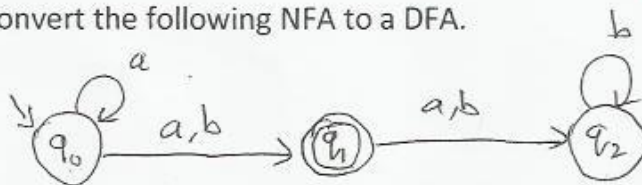
Problem 1.

Find a finite automaton for $\Sigma=\{0,1\}$ for the language that contains all strings that contain 10 but not 101.

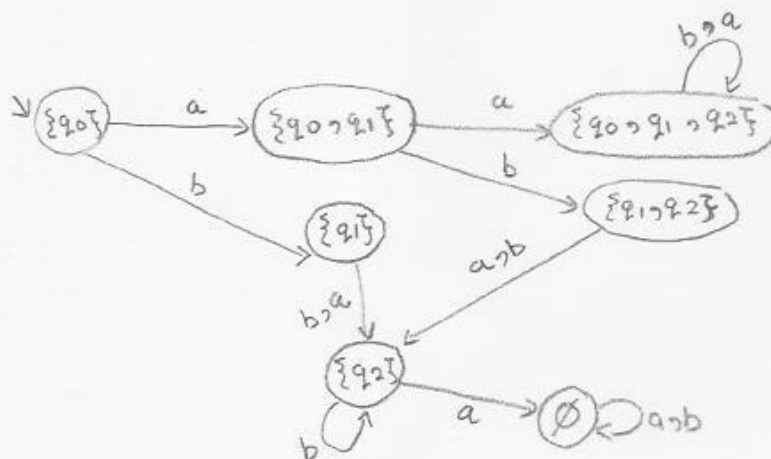


Problem 2.

Convert the following NFA to a DFA.



final states?



ID:

Name:

Problem 1.

Show that the following grammar is ambiguous.

$$S \rightarrow AB \mid aaB$$

$$A \rightarrow a \mid Aa$$

$$B \rightarrow b$$

$$\begin{aligned} S &\rightarrow AB \Rightarrow \lambda aB \Rightarrow aaB \Rightarrow \underline{aab} \\ S &\rightarrow aaB \Rightarrow \underline{aa}b \end{aligned}$$

- ∴ Two paths for one word
∴ The grammar is ambiguous

7.5
10

Problem 2.

Show that $L = \{a^n b^m c^k : 3n + m = k\}$ is context-free.

$$S \rightarrow A \mid \lambda$$

$$A \rightarrow aABccc \mid \lambda$$

$$B \rightarrow bBc \mid \lambda$$

2.5

ab cccc
aab ccccccc
abb ccccc

Test

$$S \Rightarrow A \Rightarrow aABccc \Rightarrow aaABcccc \Rightarrow aa bBcccc \Rightarrow aabcccc \checkmark$$

$$S \Rightarrow A \Rightarrow aABccc \Rightarrow abBcccc \Rightarrow abbBcccc \Rightarrow abbcccc \checkmark$$

$$S \Rightarrow A \Rightarrow aABccc \Rightarrow a aABcccBccc$$

This won't work!

University of Bahrain

Department of Computer Science

ITCS312 Automata and Formal Languages

ID:

Name:

Quiz 7

Problem 1.

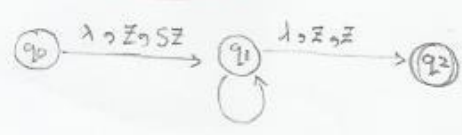
Construct an NPDA for the language $L = \{ w \in \{a,b\}^* : n_a(w) \geq 2 n_b(w) \}$.

$aba, baab, aabbabaaa, aaa$

$S \rightarrow aASb \mid bSaa \mid A$
 $A \rightarrow aA \mid a$

\Rightarrow GNF

$S \rightarrow aASB \mid bSAA \mid aA \mid a$
 $A \rightarrow aA \mid a$
 $B \rightarrow b$



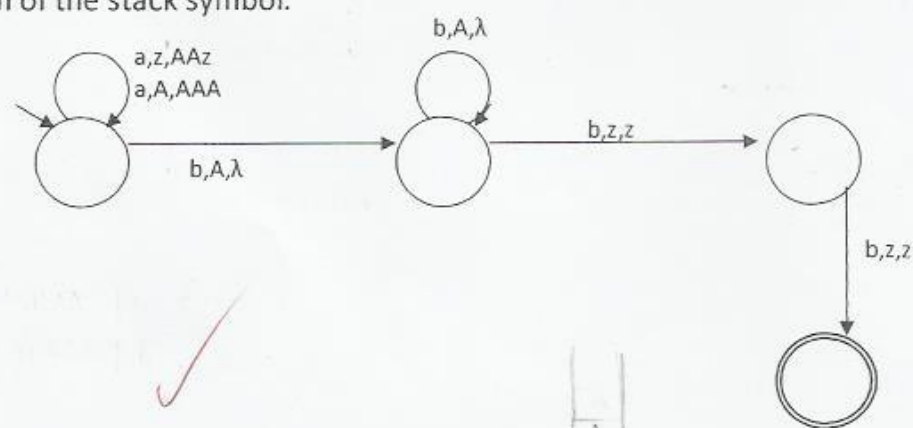
$a \rightarrow S, ASB$
 $b \rightarrow S, AA$
 $a \rightarrow S, A$
 $a \rightarrow A, A$
 $a \rightarrow A, \lambda$
 $b \rightarrow B, \lambda$
 $a \rightarrow S, \lambda$

2.5

not the right language!

Problem 2.

What is the language accepted by the following NPDA? As usual z is the bottom of the stack symbol.



$L = \{ a^n b^{2n+2} : n \geq 1 \}$

1 $a b b b b$
 $2b + 2$
 2 $a a b b b b b b$
 $2b \quad 2b + 2b$
 3 $a a a b b b b b b b b b$
 $2b \quad 2b \quad 2b + 2b$



Q1. Show that the following function defined on the domain \mathbb{Z}^+ is Turing-computable.

$$f(x) = \lceil \frac{x}{2} \rceil$$

$$\frac{10}{10}$$

